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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/970,144
Filing Date: October 03, 2001
Appellant(s): HERLEY, CORMAC E.

Mark A. Watson (Reg. No. 41,370)
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 12/12/05 appealing from the Office action mailed 08/25/05.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6285804	Crinon	9-2001
5392365	Steinkirchner	2-1995

(9) Grounds of Rejection

WITHDRAWN REJECTIONS

The following grounds of rejection are not presented for review on appeal because they have been withdrawn by the examiner.

The 2nd Paragraph 112 rejection of claim 20 has been withdrawn.

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1 – 4, 6 – 8, 11 – 13, 16 – 20, 22 – 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Crinon (6,285,804) in view of Steinkirchner (5,392,365).

In regards to claim 1, Crinon discloses A text document capture method for digitizing a text document segment in printed form, comprising: imparting a continuous lateral jittering between a digital imaging device and the [text document] (col. 2, lines 36 – 46; col. 5, line 28 – col. 6, line 3); obtaining multiple laterally-displaced digital images of all of the text document segment during the continuous lateral jittering and determining fractional pixel offset positions at which each image was obtained (col. 2, lines 36 – 46; col. 5, line 28 – col. 6, line 3; Figure 5); forming from the multiple laterally displaced images an enhanced resolution representation of the text document as a function of the fractional pixel offset positions (col. 5, line 28 – col. 6, line 3); and [de-blurring the enhanced resolution representation of the text document by thresholding the enhanced resolution into either one of two pixel luminance levels, representing foreground and background pixels, with the foreground pixels corresponding to text in the text document].

Crinon does not disclose the possible items that could be imaged with the method described above nor does the patent discus post imaging processing.

Steinkirchner teaches in the paragraph starting at column 2, line 57 that a digital image of a text document is taken. In the paragraph starting at column 3, line 8 Steinkirchner discloses that, "the eight-bit image signal from scanner 10 is compared at a thresholder". Thresholding a two-tone image into two colors is a form of sharpening; sharpening is de-blurring. The two image levels would represent foreground and background.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to include the post processing procedures disclosed by Steinkirchner to a text document captured by the method disclosed by Crinon. In order for a computer to interpret a text document a high-resolution image is required. The method disclosed by Crinon provides a faster means of imaging a text document in high-resolution over a scanner. By using the post processing procedures of Steinkirchner the text is prepared for interpretation by a computer. Thus reducing the workload further for the computer.

In regards to claim 2, The method of claim 1 in which the lateral jittering between the digital imaging device and the text document is imparted in a pair of transverse directions (Crinon: Figure 5: Item 20A shows the inter-pixels have motion in two transverse directions, x and y directions.).

In regards to claim 3, The method of claim 2 in which the transverse directions are generally perpendicular to each other (Crinon: Figure 5: Item 20A the x and y directions are perpendicular to each other.).

In regards to claim 4, The method of claim 2 in which the lateral jittering is imparted simultaneously in the pair of transverse directions (Crinon: Figure 5: item 20A).

In regards to claim 6, The method of claim 1 in which the digital imaging device includes an array of optical detectors corresponding to pixels and having pixel dimensions and the jittering moves the digital imaging device by about the pixel dimensions (Crinon: col. 6, lines 58 – 60; col. 5, line 28 – col. 6, line 3; Figure 5: Motion

estimates are performed to find motion on an inter-pixel level which is about the size of a pixel.).

In regards to claim 7, The method of claim 1 in which the text document segment is substantially all of the text document (By moving the CCD only at the pixel level substantially the entire text document is captured.).

In regard to claim 8, The method of claim 1 in which the forming the enhanced resolution representation of the text document includes calculating weighted sums from the multiple laterally displaced images (Crinon: col. 5, lines 28 – 59).

In regards to claim 11, Steinkirchner discloses in the paragraph starting at column 3, line 8 that after de-blurring the image is "then low pass filtered at 30, removing noise from the image and blurring (therefore widening) the edges of the characters". This is the equivalent to a blurring filter.

In regards to claim 12, a CCD sensor is an array of optical detectors corresponding to pixels and having pixel dimensions. The blur filter shown in the rejection of claim 11 if it is to be used on a digital image would have to have a filter dimension corresponding to that of a pixel dimension.

In regards to claim 13, A text document capture system for digitizing with a digital imaging device a segment of a text document in printed form, comprising: a jittering mechanism for imparting a continuous lateral jittering between the text document and the digital imaging device while it obtains multiple laterally-displaced digital images of all of the text document segment, said lateral jittering moving through a distance being on the order of around one pixel (col. 2, lines 36 – 46; col. 5, line 28 – col. 6, line 3); a pixel

offset determination system for determining fractional pixel offset positions at which each digital image was obtained (col. 2, lines 36 – 46; col. 5, line 28 – col. 6, line 3); and a processing system for forming an enhanced resolution representation of the text document segment from the multiple laterally displaced images as a function of the pixel offset positions corresponding to each digital image, and [for de-blurring the enhanced resolution representation] (col. 2, lines 36 – 46; col. 5, line 28 – col. 6, line 3).

Crinon does not disclose the possible items that could be imaged with the method described above nor does the patent discus post imaging processing.

Steinkirchner teaches in the paragraph starting at column 2, line 57 that a digital image of a text document is taken. In the paragraph starting at column 3, line 8 Steinkirchner discloses that, "the eight-bit image signal from scanner 10 is compared at a thresholder". Thresholding a two-tone image into two colors is a form of sharpening; sharpening is de-blurring. The two image levels would represent foreground and background.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to include the post processing procedures disclosed by Steinkirchner to a text document captured by the system disclosed by Crinon. In order for a computer to interpret a text document a high-resolution image is required. The method disclosed by Crinon provides a faster means of imaging a text document in high-resolution over a scanner. By using the post processing procedures of Steinkirchner the text is prepared for interpretation by a computer. Thus reducing the workload further for the computer.

In regards to claim 16, The system of claim 13 in which the jittering mechanism imparts lateral jittering on the digital imaging device (Crinon: Figure 5).

In regards to claim 17, The system of claim 13 in which the digital imaging device includes an array of optical detectors corresponding pixels and having pixel dimensions and the jittering mechanism moves the digital imaging device by about the pixel dimensions (Crinon: col. 6, lines 58 – 60; col. 5, line 28 – col. 6, line 3; Figure 5: Motion estimates are performed to find motion on an inter-pixel level which is about the size of a pixel.).

In regards to claim 18, The system of claim 13 in which the text document segment is substantially all of the text document (By moving the CCD only at the pixel level substantially the entire text document is captured.).

In regards to claim 19, The system of claim 13 in which the processing system includes a computer that executes software instructions to form the enhanced resolution of the text document segment and to de-blur the enhanced resolution representation (Crinon: col. 6, lines 4 – 15: Software is used to perform to create the enhanced resolution image the same processor could be used to perform the operations disclosed by Steinkirchner.).

In regards to claim 20, as mentioned previously in the rejection of claim 13, in the paragraph starting at column 3, line 8 Steinkirchner discloses that, "the eight-bit image signal from scanner 10 is compared at a thresholder" the resulting thresholded image is a representation of the enhanced resolution representation in only two image levels.

In regards to claim 22, Steinkirchner discloses in the paragraph starting at column 3, line 8 that after de-blurring the image is "then low pass filtered at 30, removing noise from the image and blurring (therefore widening) the edges of the characters". This is the equivalent to a blurring filter.

In regards to claim 23, a CCD sensor is an array of optical detectors corresponding to pixels and having pixel dimensions. The blur filter shown in the rejection of claim 22 if it is to be used on a digital image would have to have a filter dimension corresponding to that of a pixel dimension.

In regards to claim 25, the method of claim 1 and the system of claim 13 can be implemented with software stored on a computer-readable medium.

In regards to claim 26, the method of claim 2 can be implemented with software stored on a computer-readable medium.

In regards to claim 27, the method of claim 6 can be implemented with software stored on a computer-readable medium.

In regards to claim 28, the method of claim 8 can be implemented with software stored on a computer-readable medium.

In regards to claim 29, the method of claim 9 can be implemented with software stored on a computer-readable medium.

In regards to claim 31, the method of claim 11 can be implemented with software stored on a computer-readable medium.

In regards to claim 32, the method of claim 12 can be implemented with software stored on a computer-readable medium.

In regards to claim 33, claim 33 is rejected for the same reasons as claim 1. The argument analogous to that presented above for claim 1 is applicable to claim 33.

Claims 5, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Crinon as modified by Steinkirchner as applied to claims 1 and 13 above, and further in view of Matsumoto (5,801,814).

In regards to claim 5, Crinon (as modified by Steinkirchner) discloses the method of claim 1. Crinon as previously shown discloses that motion can be mechanically induced, however no further details are provided. Crinon therefore does not disclose that the jittering is cyclic. However techniques for providing mechanical motion are well known in the art. Matsumoto teaches (col. 8, lines 5 – 58) that a camera can be moved by piezoelectric elements for the purpose of increasing the resolution of an image. The motion disclosed by Matsumoto is cyclic (col. 8, lines 48 – 58).

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to use the piezoelectric elements (as taught by Matsumoto) to instill cyclic motion in the mechanical motion of the method disclosed by Crinon (as modified by Steinkirchner). Cyclic motion by its very nature is easily repeated, thus Crinon could more accurately assure that the entire image is taken before performing resolution enhancement.

In regards to claims 14 and 15, Crinon (as modified by Steinkirchner) discloses the system of claim 13. Crinon as previously shown discloses that motion can be mechanically induced, however no further details are provided. Techniques for providing mechanical motion are well known in the art. Matsumoto teaches (col. 8, lines 5 – 58)

that a camera can be moved by piezoelectric elements for the purpose of increasing the resolution of an image. The piezoelectric elements move the camera in the x and y directions, i.e., transverse directions.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to use the piezoelectric elements (as taught by Matsumoto) to create the mechanical motion of the method disclosed by Crinon (as modified by Steinkirchner). Piezoelectric elements are cheap and allow for an easily repeatable action. With a repeatable operation Crinon could more accurately assure that the entire image is taken before performing resolution enhancement.

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Crinon in view of Steinkirchner as applied to claim 13 above, and further in view of Reinsch (5,083,313).

In regards to claim 24, the system disclosed by Crinon (as modified by Steinkirchner) would require some means to calibrate the jittering mechanism. However Crinon does not disclose how this calibration would be preformed.

Reinsch teaches in the paragraph starting at column 15, line 44 that a target can be used to calibrate an imaging system.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to include a calibration target to calibrate the jittering mechanism. Overtime oscillators will change characteristics slightly, so calibration will be required to keep the movement to consistant. A calibration target would make sense for a digital imaging system like the one disclosed by Crinon.

(10) Response to Argument

(a) Rejection of Claim 20 under 35. U.S.C. 112

The rejection under 112 second paragraph has been withdrawn by the examiner.

(b) Rejection of Independent Claim 1 under 35 U.S.C. 103(a)

The crux of the applicant's argument in regards to all of the independent claims lies in the following step:

> Forming from the multiple laterally displaced images an enhanced resolution representation of the text document ***as a function*** of the fractional pixel offset positions

Based on the applicant's contentions in the brief the applicant's primary argument is that the language "as a function" distinguishes over Crinon.

To begin with, the examiner has always interrupted the term "function" to mean "based on". Crinon clearly creates an enhanced resolution image from low-resolution images "based on" inter-pixel, i.e., fractional pixel, offset positions. For example see col. 5, lines 28 – 59 of Crinon. The applicant on page 10 even states:

> unlike the Crinon reference, rather than computing global motion models, deriving motion vectors from the motion model for relating a reference image to every other image, mapping image pixels to ***"inter pixel positions" which are in turn used to map pixel intensities to "high-resolution grid points,***

From the above paragraph it seems clear that the applicant also believes that Crinon creates an enhanced resolution image from low-resolution images "based on" fractional pixel offset positions.

Therefore, although not stated in the brief, the examiner, based on the inclusion of paragraph 48 and in particular the equation ($P_E=W_AS_A + W_BS_B + W_CS_C$), has come to the conclusion that the applicant is arguing that the term "function" should be taken as a mathematical term, in this case an equation.

The examiner would first like to point out that strictly speaking the term "function" in mathematics is not a synonym for the word "equation". A function is a relationship that uniquely associates members of one set with members of another set, all functions are equations, but all equations are not functions. The equation supplied for P_E is not a function.

However, assuming for the sake of argument that the applicant's equation is a function Crinon discloses a very similar equation. Col. 5, lines 45 – 53:

> Note that in step 34 several of the closest pixels (as opposed to the closest only) could be used. In this case, the interpolation process makes use of the associated distance values to calculate the sample value at the high-resolution grid point 20. For example, each distance value can be used to determine a weighting factor specifying the contribution of the associated sample value in the final image sample value at grid point 20.

In the above, Crinon discloses an equation which would look like $P_E=W_AS_A + W_BS_B + W_CS_C+ W_DS_D$ if written out. Crinon is teaching that the four nearest pixel values are

taken and the fractional pixel offset of each is used to determine the weighting factor (W_X). This is precisely what the applicant is claiming.

To recap, Crinon creates a high-resolution image from low-resolution images based on fractional pixel offsets. The applicant does not disclose a function, but the equation the applicant does disclose closely mirrors the equation Crinon teaches. Therefore Crinon clearly teaches all of the disputed features.

(c) Rejection of Independent Claim 13 under 35 U.S.C. 103(a)

The arguments for claim 13 are the same as claim 1 and therefore the examiner's responses will not be repeated.

(d) Rejection of Independent Claim 25 under 35 U.S.C. 103(a)

The arguments for claim 25 are the same as claim 1 and therefore the examiner's responses will not be repeated.

(e) Rejection of Independent Claim 33 under 35 U.S.C. 103(a)

The arguments for claim 33 are the same as claim 1 and therefore the examiner's responses will not be repeated.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

Conclusion

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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